NON-PUBLIC?: N
ACCESSION #: 8902220079
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Grand Gulf Nuclear Station - Unit 1 PAGE: 1 OF 5

DOCKET NUMBER: 05000416

TITLE: Inadvertent High Pressure Core Spray Initiation Causes Reactor Scram on Low Water Level
EVENT DATE: 10/10/88 LER #: 88-019-01 REPORT DATE: 02/16/89

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: R. W. Byrd/Licensing Engineer TELEPHONE: (604) 437-2149

COMPONENT FAILURE DESCRIPTION:
CAUSE: SYSTEM: COMPONENT: MANUFACTURER:
REPORTABLE TO NPRDS:

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On October 10, 1988 at 1058 the High Pressure Core Spray (HPCS) system (EIIS system code: BG) and the HPCS emergency diesel generator (EIIS system code: EK) automatically initiated when an operator keyed a radio in the vicinity of the low level instrument transmitters.

About 10 seconds after the HPCS actuation, reactor water level reached +45 inches (approximately 10 inches above the normal operating range). At that point the Shift Superintendent directed operators to secure the HPCS pump. Operators secured the HPCS pump at +47.4 inches and took manual control of feedwater flow to avoid a high level trip as level reached +50 inches. The reactor water level peaked at approximately +52.5 inches causing a single RPS instrument channel to trip on reactor high water level which completed half of the scram logic.

Operators manually increased feedwater flow as level began to decrease; however, within 10 seconds of the high level channel trip reactor water level dropped to the low level scram setpoint of +11.4 inches initiating a reactor

scram. Operators continued to increase feedwater flow and manually initiated the Reactor Core Isolation Cooling (RCIC) System (EIIS system code: BN) to restore water level.

Radio transmission on the 139 foot elevation area of containment has been prohibited.

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END OF ABSTRACT

A. REPORTABLE OCCURRENCE

On October 10, 1988 the High Pressure Core Spray (HPCS) system inadvertently injected. To control the rapid water level increase, operators manually decreased feedwater flow and secured HPCS. Water level then rapidly decreased to the low level scram setpoint resulting in a reactor scram. The event is reported pursuant to 10CFR50.73(a)(2)(iv).

B. INITIAL CONDITIONS

The plant was operating at 100 percent reactor power with reactor water level normal at +35 inches (reference zero is 166.7 inches above the top of active fuel).

C. DESCRIPTION OF OCCURRENCE

On October 10, 1988 at 1058, the HPCS system (EIIS system code: BG) and the HPCS emergency diesel generator (EIIS system code: EK) automatically initiated. The HPCS injection caused reactor water level to increase. Operators verified water level was increasing by checking redundant water level instrumentation.

About 10 seconds after the HPCS actuation, reactor water level reached +45 inches (approximately 10 inches above the normal operating range). At that point the Shift Superintendent directed operators to secure the HPCS pump. Operators secured the HPCS pump at +47.4 inches and took manual control of feedwater flow to avoid a high level trip as level reached +50 inches. The reactor water level peaked at approximately +52.5 inches causing a single RPS instrument channel to trip on reactor high water level which completed half of the scram logic.

Operators manually increased feedwater flow as level began to decrease; however, within 10 seconds of the high level channel trip reactor water

level dropped to the low level scram setpoint of +11.4 inches initiating a reactor scram. Operators continued to increase feedwater flow and manually initiated the Reactor Core Isolation Cooling System (RCIC; EIIS system code: BN) to restore water level.

Reactor water level reached a minimum of -6 inches. Reactor water level was restored above the low level scram setpoint at 1100 hours, approximately one minute after the scram.

D. APPARENT CAUSE

1. Investigation

An investigation revealed that the HPCS initiation was caused by the actuation of the 'C' and 'G' channels of the reactor low water level HPCS initiation logic. An operator had keyed a portable radio on the 139 foot elevation of the containment, while walking past the instrument rack containing the channel 'C' and 'G' transmitters. Subsequent testing confirmed that a radio keyed at close range could cause current fluctuations sufficient to trip the transmitters.

The operator had attempted to contact the Control Room with his radio while in another area on the 139 foot elevation. He was unsuccessful and proceeded to the plant pager. He noticed that the transmitting indicator light on the hand-held radio was not on. He keyed the radio several times as a check as he passed by the instrument rack. The bulb on the radio had failed and the radio was actually transmitting. Radio use in this area was not restricted. The radio used was a Motorola Handi-Talkie Model 350.

Testing of different model radios on the night of the event indicated that the Model 350 radio caused adverse current fluctuations at a greater distance than the other model radios. Other model radios had to be placed directly adjacent to the transmitter rack to give large enough fluctuations to actuate the trip units. Current fluctuations were observed while keying the Model 350 as far as 4 feet from the level transmitters. The Model 350 radio used was shipped to the vendor for power setting verification and was found to be set at the normal power of 4 watts. There is minimal difference in the power settings and the frequency of the radios.

2. Previous Reviews

The original evaluation of the effect of portable hand-held radios on plant equipment did not include instrumentation in the containment because no radio repeaters were installed in the containment at that time. The original evaluation and program controls are considered adequate for areas in the Control Building and Turbine Building.

A special test was conducted in 1983 after the radio repeaters were installed in the containment. It was concluded in the test summary that radios should not be operated under the reactor vessel, within 3 feet of radiation
onitors, or within 3 feet of instrument transmitters. The
plant communications procedure was changed to strictly prohibit radio transmission in several areas including under the reactor vessel, near radiation monitoring equipment, and "other areas as posted". However, the area around instrument transmitters was not posted. This was probably due to a conscious decision based on further review of test findings.

3. Evaluation of Flow Control Response

The feedwater flow controller properly responded to the HPCS injection while in the automatic three-element control mode by decreasing flow; however, reactor water level continued to rise. The Shift Superintendent determined that the level transient was severe enough to warrant placing feedwater control in the manual mode to reduce feedwater flow further. Reactor vessel level increased from about 35 inches to +52.5 inches in about 35 seconds. When the HPCS system was secured, the reactor water level dropped faster than could be compensated with feedwater flow. The reactor water level dropped approximately 60 inches in about 10 seconds due primarily to the large feedwater flow to steam flow mismatch.

E. SUPPLEMENTAL CORRECTIVE ACTIONS

Radio use on the 139 foot elevation area of the containment has been prohibited. The only other equipment in containment which was susceptible to radio transmission was the Reactor Water Cleanup System instrument rack on the 185 foot elevation. This area has been posted to prohibit radio transmission.

Other areas of the plant where radio transmission should be prohibited have been checked and additional areas have been posted. In addition,

the prohibited zones for radio transmission have been verified to be approximately 4 to 6 feet at all instrument racks.

As a result of the investigation of this event it was noted that the measured HPCS flow during the event was slightly higher than assumed flow in UFSAR Section 15.5.1 (Inadvertent HPCS Startup). This difference was evaluated to determine if the greater HPCS flowrate had a significant affect on the results of the UFSAR transient analysis. The evaluation concluded that the greater flowrate for actual HPCS pump operation has insignificant affect on the pressure and MCPR limits for this transient. Specifics of this evaluation are discussed in Section F.

F. SAFETY ASSESSMENT

Reactor water level reached a minimum of -6 inches (160.7 inches above the top of active fuel). All systems responded to the transient properly. The event is bounded by the "feedwater controller failure with increasing flow" transient of UFSAR Section 15.1.2 as discussed in UFSAR Section 15.5.1.2.3.

As a result of the investigation of this event it was noted that the measured HPCS flow during the event was slightly higher than assumed flow in UFSAR Section 15.5.1 (Inadvertent HPCS Startup). The analysis presented in UFSAR Section 15.5.1 is based on an analysis performed by the General Electric Co. A generic set of input parameters was utilized including an assumed HPCS flow rate. The analysis was performed based on obtaining HPCS flow rates using straight line interpolation between the minimum acceptable flow rates specified in the system design specification data sheet. The transient analysis in UFSAR Section 15.5.1 assumes a HPCS flow equivalent to 8.7 percent of feedwater flow.

The HPCS flow rate on October 10, 1988 equates to approximately 11 percent of rated feedwater flow rate. This flow rate is consistent with the expected flow rate for the operating reactor pressure at which the injection occurred when compared to the actual HPCS pump curve plotted during preoperational testing.

The plant response on October 10, 1988, showed a mild pressure decrease with an accompanying neutron flux decrease. The magnitude of the changes in neutron flux, core flow, reactor pressure and hence, core voiding from the actual transient approximates the responses indicated by the transient plots in UFSAR Section 15.5.1. Thus the result of the

increased HPCS flow is determined to have minor effects on CPR.

Similarly the integrity of the fuel cladding is determined not to be challenged by this transient. Because the transient results in a pressure decrease, the vessel pressure limit is not threatened. Based on the above reasons, the increased flow rate for actual HPCS pump operation is determined to have insignificant affect on the pressure and MCPR limits for this transient.

SYSTEM ENERGY
RESOURCES, INC.

JOHN G. CESARE, JR.
Director February 16, 1989
Nuclear Licensing

U.S. Nuclear Regulatory Commission
Mail Station P1-137
Washington, D.C. 20555

Attention: Document Control Desk

Gentlemen:

SUBJECT: Grand Gulf Nuclear Station
Unit 1
Docket No. 50-416
License No. NPF-29
Inadvertent High Pressure Core
Spray Initiation Causes Reactor
Scram on Low Water Level
LER 88-019-01
AECM-89/0027

Attached is Licensee Event Report (LER) 88-019-01 which is a final report.

As discussed with Mr. Floyd Cantrell and Mr. Hugh Dance of your office the submittal of this report was delayed from February 10, 1989.

Yours truly,

JGC:mcg
Attachment

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